

Soldiers and epidemics

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Article published online: 25 May 2012

Epidemics have accompanied wars since antiquity. They have often influenced the outcome of battles and military campaigns, and have occurred among both soldiers and civilians. Favourable conditions for their emergence result from the destruction caused by fighting, the social disorganization and collapse of health systems, the slackening of hygiene and prevention of infectious diseases, and the weakening of populations, including by nutritional deficiency and deterioration in access to safe drinking water. Pathogens have also been used as biological weapons. Soldiers have sometimes been unintentional vectors of infections that have spread to the civilian population.

In the seventh century, smallpox spread through North Africa, and thereafter through Europe with the Islamic armies [1].

There is presently little evidence of a significant relationship between soldiers and the spread of HIV [2]. However, military personnel have long been considered to constitute a high-risk population for sexually transmitted infection (including HIV in sub-Saharan Africa [3]), because they stay for long periods far from their home, they have frequent commercial sex, a feeling of invulnerability, and risk-taking behaviours, and they are potentially prone to coercive sex. For the record, the French troops that invaded Naples, Italy in 1495 were responsible for the first European epidemic of syphilis, initially known as the 'Neapolitan disease' in France and the 'French disease' in the rest of Europe.

The spread of the 1918 influenza pandemic was facilitated by the crowded conditions of military camps and troop movements from the USA and probably Indochina to France during World War I. Some authors suggest that the 'Spanish' influenza had its origin in the winter of 1917, in and around military camps in northern France, where overcrowding, live pigs, geese, ducks and chickens, and mutagenic chemical weapons, could have contributed to the emergence of the pandemic virus [4].

Although the Republic of Korea had been declared 'malaria-free' in 1979, *Plasmodium vivax* malaria re-emerged in 1993 in the military population near the demilitarized zone (DMZ). In the following years, it rapidly spread and increased exponentially in the military, veteran and civilian populations, despite

the implementation in the army of mandatory chloroquine chemoprophylaxis and presumptive anti-relapse therapy with primaquine [5]. Nearly all malaria cases occurring in the regions south of the DMZ concerned military personnel or veterans who had stayed in high-risk malaria areas along the DMZ and returned to their homes, where they later developed malaria or enabled local transmission by malaria vectors.

Injuries to military personnel are frequently complicated by infections with multiresistant Gram-negative bacilli, owing both to environmental contamination and to nosocomial transmission within the military health facilities in the operational theatre. After the evacuation of these infected military patients, the multiresistant microorganisms can spread in military hospitals, and thereafter in the civilian population of the country of origin of soldiers. Widespread carbapenem-resistant *Acinetobacter* outbreaks have been recorded in USA and UK from evacuees from Iraq and Afghanistan [6]. Such transfer of pathogens from endemic areas by military personnel returning from operational theatres can occur without injury. An outbreak of Pantón–Valentine leukocidin-positive *Staphylococcus aureus* infection was reported in 2004–2005 in French soldiers operating in Cote d'Ivoire, and it subsequently spread in their families. That outbreak and its spread in families was attributed to the persistence of a highly virulent clone in the environment of the training camp in Côte d'Ivoire, where hygiene conditions were poor, and to its nasal carriage [7].

More recently, in October 2010, a cholera epidemic caused by *Vibrio cholerae* O1, serotype Ogawa, biotype El Tor occurred in Haiti, 9 months after a major earthquake and more than a century after the last reported cholera outbreak in that country. A team of French and Haitian epidemiologists conducted a spatio-temporal analysis of the incidence of cholera cases that highlighted five significant clusters, the first one being next to a United Nations camp that had been occupied since a few weeks by Nepalese soldiers, who were accused of illegal dumping of waste tank contents. Their findings strongly suggested that the epidemic had its origin in that military camp with deficient sanitation [8,9]. In addition, a cholera outbreak had been reported in Nepal's capital few weeks before troops moved to Haiti, and the results of sequencing and typing of dozens of clinical isolates from Haiti,

Nepal and other parts of the world were consistent with Nepal as the origin of the Haitian outbreak [10].

The above examples reveal several risk factors that contribute to the involvement of soldiers in the emergence of epidemics and the spread of pathogens within the civilian populations. The soldiers may lack immunity and appropriate control measures against newly encountered endemic pathogens in their deployment areas. In the absence of control and supervision, the military may be tempted to free itself from the health rules, regulations and laws of the countries where it is stationed. When military management is weak, implementation of the hygiene and preventive measures could be neglected. Overcrowding and poor hygiene conditions could facilitate transmission within the military population and amplification of the reservoirs of pathogens. The mobility and diverse origins of the troops could favour the spread and mixture of microorganisms from different countries and the spread of resistance and virulence factors.

The United Nations, African Union and other peacekeeping operations presently involve more than 100 000 uniformed personnel through the world, mainly in developing countries and inter-tropical areas. Most of the contributors of these troops are low-income and middle-income countries with armies that can lack trained, experienced and appropriately equipped military health services. The United Nations and other international organizations, such as NATO and the African Union, that mandate such troops within civilian populations that are weakened by war or social disorganization have to ensure appropriate health screening and support of the soldiers, and close monitoring of potentially epidemic diseases. They must also publicize their actions and not try to deny the problems. Otherwise, they risk losing the credibility and acceptability of these troops, with potentially major political and health implications. There are not always independent epidemiological and microbiological capabilities present on-site to detect and respond to epidemics.

Acknowledgement

The author acknowledges P. Piola, Institut Pasteur de Madagascar, for reviewing the manuscript.

Transparency Declaration

The author declares having no commercial relationship or potential conflict of interest of any nature related to the present article.

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